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Human Repeated Acquisition and Performance During Diphenhydramine and Cold Air Exposure.

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)
Male subjects were trained on a performance assessment battery (PAB) that included the repeated acquisition and performance of twelve - member response sequences. Subjects were administered 50 or 100 mg of diphenhydramine HCL in combination with air temperatures of 22 or 4 degrees C. The results indicate decreases in response latency during cold exposures with and without the drug. There was also an inverse relationship between error levels and the number of response sequences completed during each session.

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INTRODUCTION

Navy and Marine Corps personnel are increasingly required to conduct operations in cold environments. Cold exposure has been demonstrated to produce a range of behavioral effects, including the impairment of short term memory, decreases in accuracy of responding, and decreases in response latencies. Diphenhydramine HCL (DPH) is a standard medication issued to Navy and Marine Corps personnel. At therapeutic doses, this drug acts as a CNS depressant, often producing diminished alertness and slowed reaction times. The purpose of this study was to evaluate the effects of DPH and cold exposure on a task involving both accuracy and speed of responding.

METHODS

Males between the ages of 24 and 26 years served as subjects. The subjects performed on an eight task performance assessment battery (PAB). Two components of this PAB were the repeated acquisition and the performance of 12-member response sequences performed on a four button response panel.

The PAB was implemented on a microcomputer. During the repeated acquisition component, the CRT displayed the outline of twel·· squares on a black background. The squares filled red, from left to right, with each successive correct response. Incorrect responses produced a one second timeout (TO). The component lasted for 25 sequence completions or five minutes -- whichever occurred first. The conditions during the performance component were identical except that the background color was blue and the squares filled green.

During the repeated acquisition component, the response sequence changed for each session. For instance, during session one, the sequence might be 7342341231 41, and the following session it might be 141342314232. A total of

24 different sequences were used. During the performance component, the response sequence was always 421431341232.

Medical coverage was provided. The subjects wore shorts, T-shirts, and socks. Each subject was administered placebo and 50 or 100 mg of DPH while exposed to air temperatures of either 4 or 22 degrees C. Each subject was exposed to each condition three times. All experimental sessions were conducted in a temperature controlled chamber.

RESULTS

Response latencies and the number of sequences completed each session showed consistent changes in two of the three subjects. These subjects responded faster during the cold conditions than during comparable ambient conditions. This finding was more pronounced during the cold plus drug conditions than during the ambient plus drug conditions. Overall, these subjects showed reductions in response latencies of 35% and 26%, respectively, during all cold exposures combined. The third subject showed moderate increases in response latencies during all drug conditions and no change during the cold-placebo condition. Accuracy of responding as measured by session percent errors showed no consistent changes as a function of either cold exposure or drug administration. There were no consistent effects on either accuracy or latency of responding in the performance component.

CONCLUSIONS

* Response latencies in a repeated acquisition procedure were reduced by cold exposure alone and in combination with diphenhydramine administration.
* Accuracy of responding was not altered consistently by either cold exposure or drug administration.

These data support previous findings of cold related response latency decreases, but do not support accuracy decreases.

ACKNOWLEDGMENTS

Research and Development Command work unit numbers 63706N.M0095.004.1008 and 6376A.3M463764B995.AB.081-1. The opinions and assertions expressed herein are the private ones of the authors and are not to be construed as official or reflecting the views of the Department of Defense, the Department of Navy, or the Naval Service at Large.

FIGURE LEGENDS

Figure 1. Average response latencies in seconds for three subjects. Performance test data are presented on the left side of the figure and repeated acquisition data on the right side. The filled columns represent data from 22 degree C air exposures, and the cross-hatched columns represent data from 4 degree C exposures. Diphenhydramine doses of 0, 50, or 100 mg were investigated.

Figure 2. Percentage of sequences completed out of a total of 25 per session, averaged over three sessions, for three subjects. The filled columns represent exposures at 22 degrees C, and the cross-hatched columns represent exposures at 4 degrees C. Diphenhydramine doses of 0, 50, and 100 mg were investigated.

Figure 3. Percent errors during ambient and cold air exposures alone and in combination with diphenhydramine administration. Performance test data are presented on the left side of the figure and repeated acquisition data on the right side. The filled columns represent data from 22 degree C air exposures, and the cross-hatched columns represent data from 4 degree C exposures. Diphenhydramine doses of 0, 50, and 100 mg were investigated.

Figure 4. Data from consecutive blocks of five sequences from representative ambient and cold air exposures for each of three subjects. The total number of errors emitted in each block are presented on the left side of the figure, and the total time in seconds to complete each block is presented on the right side.

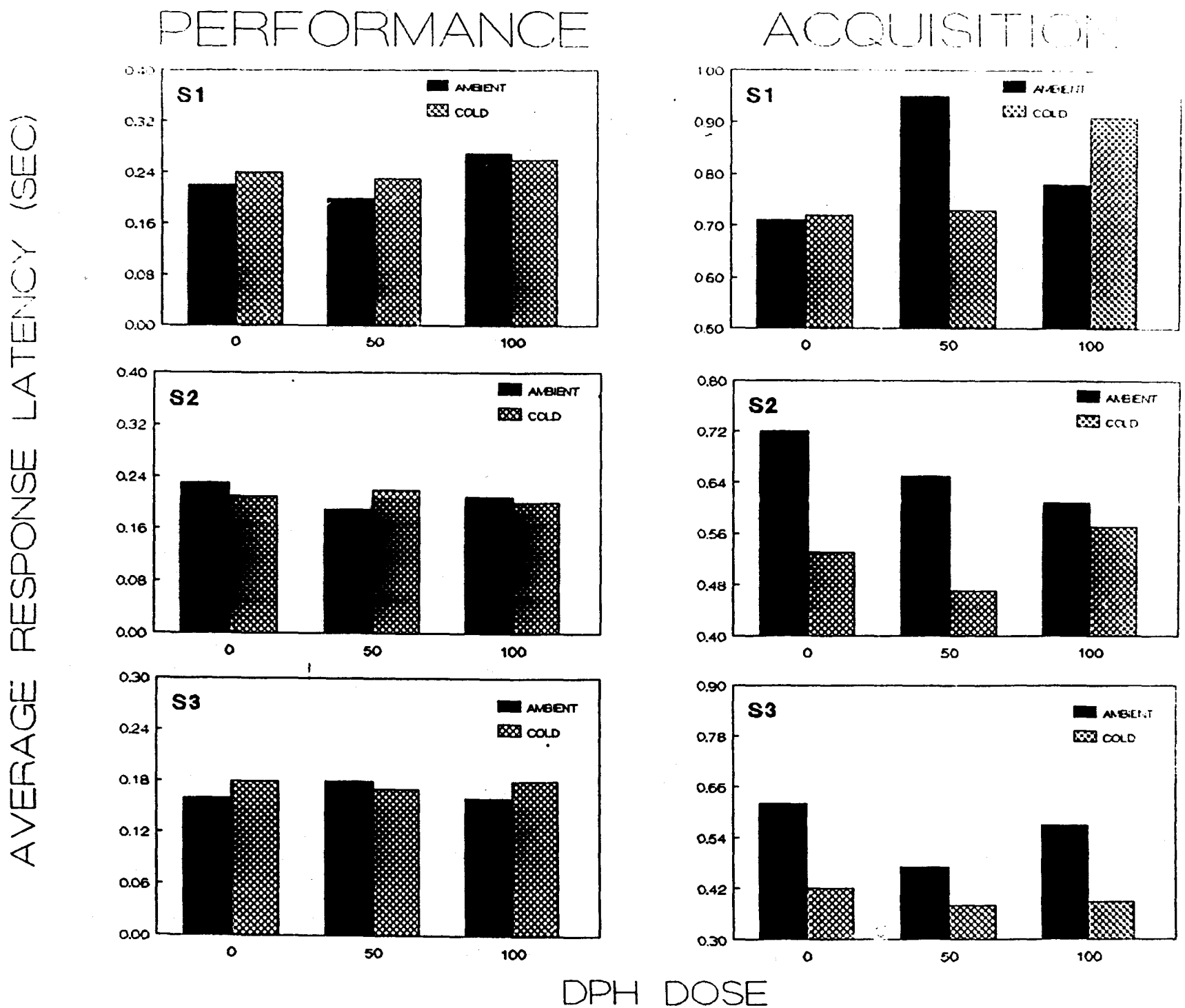
PERFORMANCE
ACQUISITION
AVERAGE RESPONSE LATENCY (SEC)
S1
S2
S3
AMBIENT
COLD
0.00
0.08
0.16
0.24
0.32
0.40
0.60
0.70
0.80
0.90
1.00
0.40
0.48
0.56
0.64
0.72
0.80
0.30
0.42
0.54
0.66
0.78
0.90
0
50
100
DPH DOSE

FIGURE 1

REPEATED ACQUISITION
S1
AMBIENT
COLD
120
96
72
48
24
0
0
50
100
S2
AMBIENT
COLD
120
108
96
84
72
60
0
50
100
S3
AMBIENT
COLD
120
106
92
78
64
50
0
50
100
PERCENT SEQUENCES COMPLETED
DPH DOSE

FIGURE 2

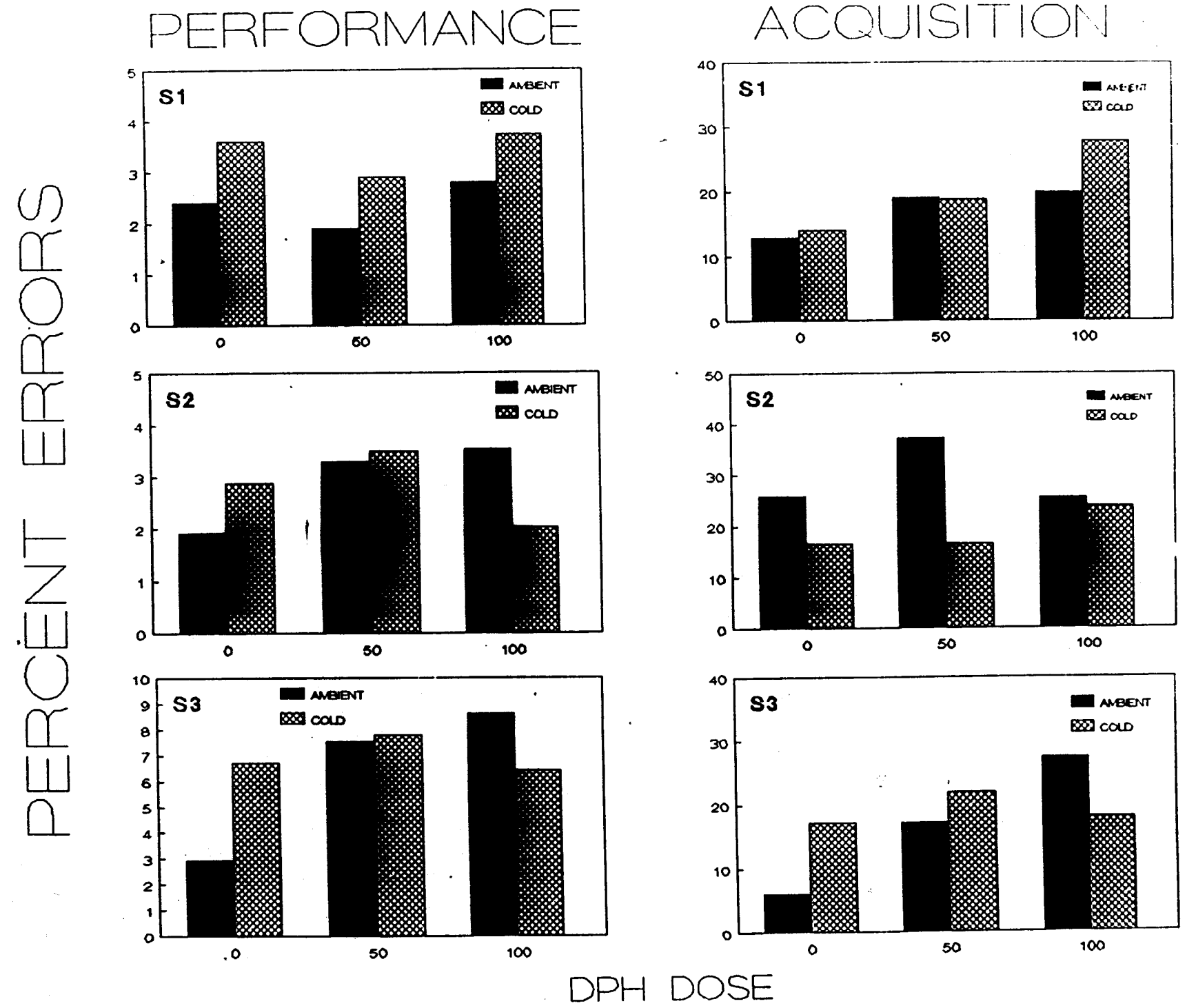
PERFORMANCE
ACQUISITION
PERCENT ERRORS
S1
S2
S3
AMBIENT
COLD
0
50
100
DPH DOSE

FIGURE 3

REPEATED ACQUISITION

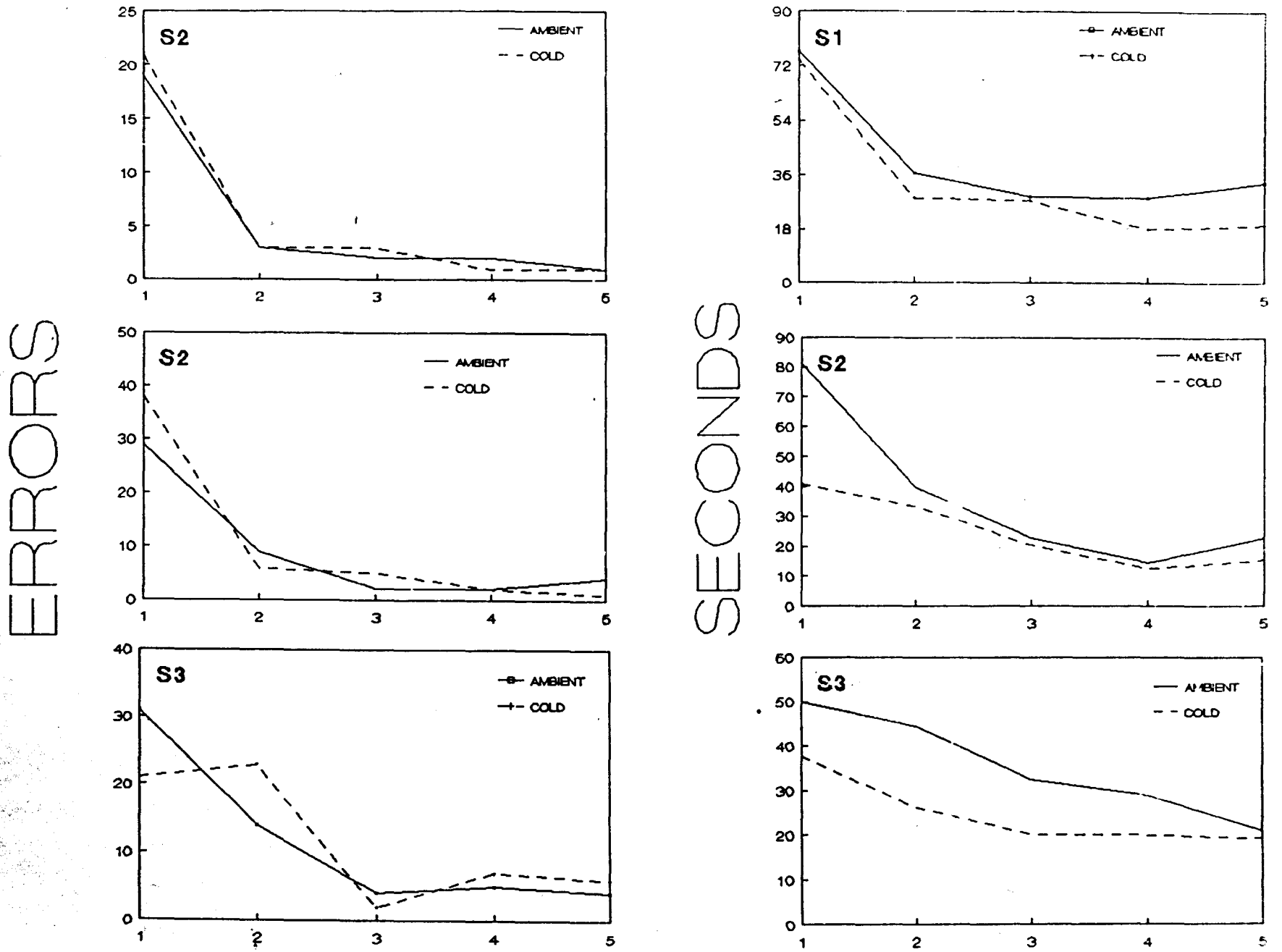

FIGURE 4